Conservation Measure #1 – Water Facilities and Operations

CM1 estimates aquatic life benefits that are not scientifically supported, omits costs and benefits to aquatic life from CM actions, and claims benefits that are not likely to be achieved. CM1 promises results that are unlikely or physically impossible. The inevitable trade-offs needed to achieve multiple goals are not identified (at least not in this CM). Real evaluation of the CM is not possible in the absence of operational descriptions so the role of outflow manipulation, as included in CM1, is unclear. Successful optimization of coordinated water operations requires explicit estimates of aquatic life benefits and costs, as well as water supply reliability costs and benefits.

Aquatic life benefits from northern intake bypass flows are not clear or appear to be minimal. It appears that there is minimal improvement in fish entrainment and loss from operating a new Delta Conveyance because the times and conditions when entrainment effects of present facilities are greatest will continue to occur after the Delta Conveyance facilities are operating (since use of the northern intakes will be limited to times of higher Sacramento River flows). At such times, entrainment at south Delta facilities has historically been low. South Delta intake facilities will continue to operate at times when Sacramento River flows are not at higher levels, including conditions when entrainment effects of the south Delta facilities are greatest for T & E species. The northern intakes will only be operable at times when entrainment and loss with the existing facilities have been of less concern.

Estimated environmental benefits from dual diversion points (north and south Delta) will potentially be reduced by issues that are not addressed in CM1. The current trash racks, fish screens and diversion facilities in the south Delta are not proposed to be changed. Invasive aquatic weeds and deferred maintenance have greatly impaired the effectiveness of the fish screens for much of the last 20 years. Redirecting diversions to these facilities will expose fish to the threats of salvage operations and ineffective screens. In addition, the impact of an invasion of Dreissenid mussles into the Delta, specifically to the southern Delta, is not addressed in CM1. The invasion of these mussels is very probable and the southern Delta provides suitable habitat for Dreissenid mussels. Impacts from these mussels on freshwater diversions in the Great Lakes and Lake Mead is informative.

Reoperation of reservoirs may have negative impacts on upstream availability of cold water, in-stream flows and other essential aspects of riverine habitat. In addition, CM1 does not contain a plan for how reoperation of reservoirs for pulse flows will be coordinated. A trade-off implied in the described benefits of the new northern facilities are pulse flows resulting from coordinating reservoir releases with reductions in exports at the northern facilities to produce 'pulse flows' to guide migrating fish. The CM does not identify the potential impacts to aquatic life that may result from re-operation of the reservoirs. Identifying these impacts requires coordination with the operators of these facilities. Such reservoir-based production of pulse flows has been accomplished on the San Joaquin River as part of the Vernalis Adaptive Management Program (VAMP). VAMP required considerable planning and negotiation. CM1 does not identify such a watershed-wide water management approach. Outlining coordination methods for pulse flows would increase the understanding of how pulse flows will occur and their potential impacts, and would improve the probability that pulse flows will have their desired effect while identifying and addressing any potential negative impacts.

Also not addressed in CM1 (or in CM13) is the potential spread of harmful algal blooms (HABs) resulting from reducing exports from the south Delta. CM1 cites reduced exports from the south Delta as a positive benefit of this CM, but it will also provide better conditions for HABs. The balance between multiple ecological impacts needs to be considered.

The claimed benefits of rearing habitat and migratory corridors for lampreys and adult salmon are not supported. [3.4.2.2." ammocoetes may forage for many years in the Plan Area before beginning to metamorphose and migrate towards the sea."]. The information available to us suggests

that larval lampreys are found in the Delta only as a result of high flow washouts from upstream. Adult salmon migration will not be improved up the Sacramento by pulse flow associated with operation of the new northern facilities because they are guided by the unique chemical scent of their natal waters, not by pulse flows. ["Most or all of the covered fish species (the juvenile and adult lifestages of Chinook salmon, steelhead, delta smelt, longfin smelt, sturgeon, lamprey, and splittail) are expected to use hydrodynamic cues (e.g., channel flow direction and magnitude) to help guide their movement through the Delta."].

Similar benefits claimed for the migration of adult salmon up the San Joaquin River are more likely since river flows in the season of adult upmigration have in recent years been less than a fifth of the concurrent export rates. Thus, any San Joaquin River water that could reach the bay would likely improve adult upmigration by providing the chemical cues they need but currently do not receive. However, in many years, San Joaquin River inflows are so low in the season of adult migration that reducing exports may not be adequate to establish such a migratory corridor.

Several statements seem to overestimate benefits. For example:
- *"Operation of the new north Delta diversions is expected to substantially improve flow patterns in the south Delta by reducing exports from the south Delta and timing flows in the north Delta to improve Old River and Middle River positive (i.e., northerly) flows."*

Reducing exports in the south Delta will make flows in Old and Middle rivers less negative, but flows in the Sacramento River cannot affect flows in Old and Middle rivers.

- *"Implementation of CM1 will also produce a variety of important benefits that are not closely tied to the protection and recovery of covered species and natural communities. These include restoring and protecting ecosystem health..."*

Conservation Measure #4 - Wetland restoration

Regarding the statement: "Restore tributary stream functions to establish more natural patterns of sediment transport", no description is given of how sediment from tributary streams will be made available for transport. The clearing of the Delta as a result of sediment trapping behind dams has been a large issue for salt pond restoration lower in the estuary. Wetland restoration, especially 65,000 acres, is likely to require a more positive sediment budget than the Delta currently receives. Restoration in some areas is likely to lead to sediment trapping that will deprive other areas of sediment. Combined with sea level rise, restoration may not be possible at the depths proposed or for the plant communities intended.

Conservation Measure #15 - Predator control

Expected predation at the new intakes is addressed primarily thought targeted efforts to reduce the striped bass population. Since striped bass are an abundant and wide-ranging species, predator control would have to be instituted throughout their range in order to reduce their impact at areas, like the new intakes, that afford enhanced foraging opportunities for them. Similar efforts elsewhere have had limited success. Such a program would also engender both regulatory and popular resistance as striped bass are a prominent feature of the sportfishing uses of the estuary.

Pikeminnow are a native fish and, as such, seems an unsupportable candidate for targeted destruction.

A more productive approach to reducing predatory impacts at the new facilities would be to incorporate and enhance those behaviors that have permitted coexistence of these predator and prey species for the last 150 years (eons in the case of pikeminnow), i.e., salmonids tend to migrate

downriver at night when visual predators like striped bass and pike minnow are least effective; salmon migrate in large groups so that predators become satiated; and salmon may hide in shallow water during daylight hours where predators cannot as effectively forage. Reducing illumination at the intakes during nighttime hours was effective at Red Bluff Diversion Dam. Additional tools that might reduce predation include: provision of shallow, weed-free habitats for salmon to hide in during the day near the intakes; and, perhaps, evening releases of minnows to divert predator attention. Such behavioral tools are more likely to succeed and less likely to produce conflict with other users of aquatic resources. For localized predator control, improved fishing access at the intakes could reduce predation rates in the short term during periods of salmon outmigration.

Conservation Measure #20 – Recreational Users Invasive Species
&
Conservation Measure #13 – Invasive Aquatic Vegetation Control

These two conservation measures accurately describe the difficulties posed by the many exotic species that have invaded the Plan Area. Introduced weeds occupy areas that might otherwise be suitable for target species, provide habitat for invasive fish that prey on target species, and greatly alter the foodweb upon which target species depend. **CM #20 is solely concerned with reducing the spread of new introduced species into the Plan Area and does not address the impacts of species already here or expected to invade soon.** CM #13 is does address the spread of new species as well as plants already in the Plan Area and the reducing the area occupied by those that are seen to have the greatest effect on target species.

The proposed actions have possible downsides that should be explicitly recognized:

1. **Use of herbicides to control SAV is associated elsewhere with increased occurrence and abundance of harmful algal blooms.**
2. Most SAV in the Delta are spread by hydrodynamic processes – i.e. pieces break off and float into new areas. In years of high river flow, floating plants are found throughout the Plan Area. Therefore, **the inspection of boats in the Delta is unlikely to have any impact on the spread and abundance of weeds already in the Plan Area.**
3. Actions to control SAV repeatedly refer to prioritizing "upstream" source populations; in a tidal estuary, the concept of "upstream" has limited utility and could lead to inappropriate priorities.

Neither CM addresses the role of invasive species in the overall BDCP effort. (Perhaps this is done elsewhere?) Some questions could be addressed with information currently available include:

1. What physical aspects of Cache Slough and the freshwater portions of Suisun Marsh prevent the dominance of introduced SAV in these areas? How do areas proposed for restoration compare in these aspects and can restoration be done in a way that inhibits the domination of SAV in newly flooded areas?
2. Is spongeplant likely to make fish screens and trash racks at south Delta diversions less effective? What structural or operational changes will be needed?
3. Are quagga mussels likely to make fish screens and trash racks at south Delta diversions less effective? What structural or operational changes will be needed? What changes/technology have been instituted in large water diversions in the Great Lake that might be transferable?
4. What ecological impacts of quagga mussels and spongeplant can be reasonably expected in the Plan Area?
5. What are the most likely other invaders of this estuary, based on recent invasions in other estuaries that are connected to ours by commerce?

Programs like those described in the CM's cannot be expected to prevent invasion over the 50 year duration of the Habitat Conservation Plan. They can be a valuable tool in allowing time to prepare for likely impacts and in delaying the financial and economic impacts that future invasives might produce. Containment and eradication programs around the world give little reason to expect long-term embargo of aggressive invaders like dreissenid mussels and South American spongeplant that are already in California.

Conservation Measure #15 - Stockton Deep Water Ship Channel Dissolved Oxygen Levels

As with the likely increase in HABs discussed under CM1 and CM13, altered flow regimes due to decreased reliance on the southern delta diversion site is likely to increase residence times in south Delta channels. As suggested under CM1, this may have beneficial impacts on food production in south Delta channels, but this increase in food and longer residence time is likely to increase the incidence or degree of low dissolved oxygen in the Stockton Deep Water Ship Channel. Thus, **CM15 needs to address not only protecting DO levels as they presently occur, but more importantly, as they are likely to be as a result of the suite of conservation measures proposed in the plan.**